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conditions were believed to be natural. At twilight the salamanders come out from the mossy logs, and the male having found a mate crawls under her body, working his way forward. His front legs are swung around those of the female and he strokes the under side of her head with his nose. After a time a spermatophore is deposited on the moss. It is a pyramidal structure 8–10 mm. high and 4–6 mm. wide, sharply pointed with the apex upward. After its deposition the male swings his body 90 degrees to one side, but retains his grasp, and his head remains beneath that of the female. The cloaca of the female is thus brought over the spermatophore which is taken up before the pair separates. Mating occurs from July to September or October, and the spermatophores are always deposited on land. The eggs are fertilized and in the following spring or early summer the young are laid. A new set of eggs is then mature and ready for fertilization.

F. T. L.

Stone-gathering Fishes. — In the *American Naturalist* for May (pages 323–327 of the current volume), Dr. Alfred W. G. Wilson has given important information and excellent illustrations of so-called "Chubs' Nests." Although, as stated in a foot-note, no account of these nests is included in my article on "Parental care among fresh water fishes," it is recorded (p. 436) that several American cyprinids "also take care of their eggs, especially the Horned Dace (*Semotilus atromaculatus*), the Black-headed Dace (*Pimephales promelas*), and the Stone-roller (*Campostoma anomalum*)." I did not give any further information for two reasons; the data in the books were unsatisfactory, and Professor Jacob Reighard had informed me that he would soon publish an account of the habits of these fishes.

The evidence as to the exact species that heaps the stones in question needs confirmation. Dr. C. C. Abbott, in "A naturalist's rambles about home" (1884, p. 408) positively declares that *Semotilus corporalis* (called by him *bullaris*) "differs materially from the birds and even many fish" in that "it does not concern itself with the care of its offspring. Once the eggs are laid upon their bed of sand, all care as to their future vanishes"; he says nothing about the oviposition of *Semotilus atromaculatus* noticed on page 409 and called by him *S. corporalis* (p. 479).

Semotilus atromaculatus occurs in Canada as well as *S. corporalis*; it is known not only as Dace but as Chub, both English terms being applied to this American fish which is no nearer one than the other.

The question thus arises whether the fish which prepared the chubs' nests observed by Dr. Wilson was *Semotilus corporalis*[1] or *S. atromaculatus*; the former has been declared not to be a nest-maker and the latter is known to be such.

Our own common catfish does indeed carry "stones *away* from its nest" but the following instance of the contrary habit has been described in my article (p. 453). The Australian catfish (*Arius australis*) according to Professor Richard Semon resorts to flat, sandy, and stony parts of the river under a rapidly passing current to spawn. "When depositing its eggs and building its nest the fish goes to work in the following way. It begins by preparing a bedding about half a yard in area, consisting of gravel and small pebbles among which it deposits the spawn which is instantly milted by the male. After this it covers the eggs by several layers of bigger stones, thereby preventing them from being washed away by the stream, or carried off by water birds . . . . or by marauding little fishes. The material for this defensive structure is derived from the above mentioned ring (surrounding the nest) which thereby becomes devoid of all stones and gleams brightly in its smooth garb of white sand. It is wonderful to observe the accuracy of the fish's handiwork and the perfect circle described by the ring. So far as I could see the fish moved the bigger stones by pushing them along with its tail. The whole affair shows a very clever arrangement, the eggs being well shielded from enemies, well ventilated by the current, and even protected against being mud-stifled (save in case of a downright flood)."

I may add that the earliest detailed notice of a stone-gathering cyprinid that I know of, was communicated by Dr. W. H. Gregg to the *American Naturalist* in 1879 (vol. 13, p. 321); the fish was identified by him as *Rhinichthys atronasus*.

THEODORE GILL

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[1] In Dr. Wilson's paper (p. 327) *Semnotilus corporalis* Mitchell should read *Semotilus corporalis* (Mitchill).